Contents lists available at IOCS

Science Midwifery

journal homepage: www.midwifery.iocspublisher.org

Causal model of decision-making for type 2 diabetes mellitus patients regarding self-management

Muhammad Amin Rais[1], Mitha Permata Dini[2], Stefanus Supriyanto[3]

[1,2,3]Administrasi & Kebijakan Kesehatan, Fakultas Kesehatan Masyarakat, Universitas Airlangga, Surabaya, Indonesia

ARTICLE INFO

Article history:

Received Apr 15, 2024
Revised Apr 19, 2024
Accepted Apr 25, 2024

Keywords:

Diabetes Mellitus
Decision-Making
Self Efficacy
Self-Management

ABSTRACT

Indonesia faced a 49.9% mortality rate in 2019 due to diabetes mellitus, predominantly Type 2 DM, accounting for over 90% of cases. This type of diabetes, often complicated, stands as a leading cause of death in the country. Managing Type 2 DM necessitates medical care and self-management education to prevent long-term complications. Effective strategies encompass education, nutritional therapy, exercise, and pharmacological treatment, reliant on adherence, knowledge, and self-awareness. The doctor-patient relationship significantly influences adherence, emphasizing the need for enhanced decision-making frameworks. This study, employing an analytic observational approach with 99 respondents, explores decision-making models for Type 2 DM self-management in primary and secondary healthcare settings. Results from Partial Least Squares (PLS) analysis indicate patient (0.253), doctor (0.344), and family (0.312) factors influencing decision-making, which, in turn, impacts self-efficacy (0.330). Family dynamics strongly correlate with self-efficacy (0.550), further impacting self-management (0.679). Recommendations advocate shared decision-making, emphasizing disease knowledge, patient involvement in treatment planning, adequate consultation time, and increased family participation to bolster self-efficacy and self-management in Type 2 DM patients.

Corresponding Author:

Muhammad Amin Rais,
Administrasi & Kebijakan Kesehatan,
Universitas Airlangga,
Kampung Yadika Blok C No. 5 Bangil, Kab. Pasuruan, 67153, Indonesia
Email: muhammad.amin.rais-2022@fkm.unair.ac.id

INTRODUCTION

The ongoing epidemiological transition worldwide has resulted in a shift in disease patterns, transitioning from infectious to noncommunicable diseases. Presently, noncommunicable diseases (NCDs) stand as the leading cause of mortality globally. NCDs persist as a principal contributor to poor health globally and account for seven out of ten premature deaths in 2019 (World Health Organization, 2022). Globally, NCDs contributed to 60.8% of all deaths in 2000, escalating to 73.6% in 2019, while infectious diseases decreased from 30.7% in 2000 to 18.4% in 2019 (World Health Organization, 2022). This shift is marked by the four major NCDs causing mortality: cancer, cardiovascular diseases, diabetes, and chronic respiratory diseases (World Health Organization,

2022). According to the World Health Organization (2022), advancements in prevention, diagnosis, and treatment have contributed significantly to the decline in global NCD-related deaths, decreasing from 22.9% in 2000 to 17.8% in 2019. Reductions in mortality have been observed in chronic respiratory diseases (37%), cardiovascular diseases (27%), and cancer (16%). However, there has been a 3% increase in deaths attributed to diabetes. In 2019, Indonesia ranked third highest in diabetes-related mortality, accounting for 49.9% (IHME, 2022). In 2021, Indonesia stood as the sole Southeast Asian nation with the highest diabetes-related mortality globally, recording 236 thousand deaths (International Diabetes Federation, 2021). The International Diabetes Federation (IDF) reported approximately 19.46 million individuals in Indonesia living with diabetes, marking an 81.8% increase from the 2019 figures.

Diabetes Mellitus (DM) is a chronic illness arising when the pancreas fails to produce sufficient insulin or when the body cannot effectively utilize its insulin. This often leads to hyperglycemia in DM patients, and uncontrolled hyperglycemia can result in serious damage to the body's systems, particularly nerves and blood vessels (World Health Organization, 2016). DM can manifest gradually and is recognized as a silent killer due to often going unnoticed by those affected. Individuals with diabetes face significantly increased health complications, resulting in diminished quality of life, heightened medical care needs, and undue stress on families. Classified by its causes, DM includes type 1 DM, type 2 DM, other specific types of diabetes, and gestational DM (PERKENI, 2021). Type 2 DM exhibits the highest prevalence among the various types, representing over 90% of all diabetes cases (Laakso, 2019). Presently, individuals affected by type 2 DM account for approximately 6.28% of the global population, with over 1 million deaths reported in 2017 due to this condition and its associated complications (Khan et al., 2020). The International Diabetes Federation (2021) also asserts that diabetes with complications stands as one of the primary causes of death in Indonesia.

WHO predicts a surge in type 2 DM patients in Indonesia, from 8.4 million in 2000 to approximately 21.3 million by 2030 (PERKENI, 2021). Complications arising from DM can affect both macrovascular and microvascular blood vessels and the nervous system or neuropathy. These complications can manifest in both long-standing and newly diagnosed type 2 DM patients, leading to acute and chronic complications if the condition remains poorly controlled (PERKENI, 2021). The prevalence of complications in type 2 diabetes patients tends to rise and worsen due to patients' inability to manage their condition independently (American Diabetes Association, 2024). This significantly impacts human resource productivity and escalates healthcare costs, ultimately influencing social and economic development (O'Connell & Manson, 2019). Complications in type 2 DM can be prevented or mitigated through blood sugar, blood pressure, and HDL cholesterol level control.

Additionally, managing type 2 DM necessitates medical care and self-management education to prevent and reduce long-term complications (American Diabetes Association, 2024). As a preventative measure against complications, various management and treatments for DM are necessary, including education, medical and nutritional therapy, physical exercise, and pharmacological therapy (PERKENI, 2021). These efforts hinge on compliance, knowledge, and self-awareness (Kumar & Mohammadnezhad, 2022). Several factors influence compliance, including the doctor-patient relationship (Iis, 2021). This behavior results from the complex interaction between patient information and motivation and external mediators of their behavior. When making decisions, patients are aware of potential obstacles they may encounter in implementing these decisions and their ability to overcome them. Thus, their contribution with this information to the decision-making process can facilitate the selection of treatment strategies most likely to succeed (Montori et al., 2006).

Meaningful collaboration can be realized through patient involvement in treatment choices and long-term care decisions. This ensures patient autonomy and self-management, vital in managing chronic conditions (Barksdale et al., 2014). Numerous professional organizations,

consumers, and governmental bodies advocate for patient involvement in various ways in making decisions about their healthcare. Patient involvement in decision-making is valued for its inherent rights and perceived role in achieving positive healthcare outcomes. Patient involvement in decision-making may have positive implications for health status. It can assist patients in comprehending and engaging in decisions regarding healthcare. Patient involvement in decision-making is also crucial in determining behavior related to healthcare outcomes. Appropriate patient involvement in decision-making can enhance the potential for patients to contribute to their healthcare (Entwistle & Watt, 2006). Based on the context mentioned above, this study's problem statement is the high mortality rate of 49.9% due to DM in Indonesia in 2019. With this background and problem identification, the research problems can be formulated as follows: a) Do patient factors (knowledge, lifestyle, and comorbidities), doctor factors (disease information and treatment plan information), and family factors (family support) influence decision-making among DMT2 patients?, b) Does family factor (family support) influence the self-efficacy of DMT2 patients?, c) Does patient decision-making influence the self-efficacy of DMT2 patients?, d) Does patient self-efficacy influence the self-management of DMT2 patients?

RESEARCH METHOD

Participant characteristics and research design

This study employed an observational analytic approach, utilizing a cross-sectional research design. The research was conducted at RS Muji Rahayu Surabaya, Puskesmas Manukan Kulon, and Puskesmas Balongsari. The study included outpatient type 2 diabetes mellitus (DM) patients meeting specific criteria: conscious and cooperative individuals attending these healthcare facilities during the data collection.

Sampling procedures

The sampling method involved random assignment. A total of 47 patients from RS Muji Rahayu and 52 patients (26 each) from Puskesmas Manukan Kulon and Puskesmas Balongsari constituted the sample size.

Sample size, power, and precision

The determination of sample size was based on the Lemeshow formula, which considered the average monthly number of patients at the respective healthcare facilities. The calculation aimed to achieve adequate representation without exceeding resource constraints.

Measures and covariates

The study's primary and secondary measures encompass a spectrum of crucial factors, including patient-related elements such as knowledge, lifestyle, and comorbidities, alongside doctor-oriented aspects encapsulating disease information and treatment plans and family dynamics gauging the level of support provided. Data collection employed structured interviews utilizing a standardized questionnaire. The questionnaire underwent validation and reliability testing on a subset of 20 respondents, ensuring a foundational level of assessment accuracy.

Data analysis

Data analysis involved several stages. Firstly, descriptive analysis characterized respondent demographics using frequency and percentage values. Subsequently, Partial Least Square (PLS) methodology was employed due to its capacity to analyze latent variables and accommodate non-normally distributed multivariate data. PLS analysis included: outer model evaluation for assessing validity and reliability and inner model evaluation to delineate relationships between latent variables based on the study's substantive theory.

RESULTS AND DISCUSSIONS

The study incorporated 99 patients, drawn using random assignment techniques from RS Muji Rahayu, Puskesmas Manukan Kulon, and Puskesmas Balongsari. Respondent characteristics, such as gender, age, duration of diabetes mellitus (DM), and educational background, were examined.

Respondent's Characteristics

According to Table 1, among type 2 DM patients in both hospitals and community health centers, there was no disparity in gender representation, with females comprising 69.7% and males 30.3%. The study revealed that the highest educational attainment for type 2 DM patients in both settings was high school graduation at 44.4%. The decision-making model selected by patients in the hospital setting, according to Table 1, predominantly leaned towards the shared model at 70.2%, followed by the paternalistic model at 25.5% and the informed model at 4.3%. Likewise, in community health centers, the shared model was prevalent among patients, constituting 71.2%, followed by the paternalistic model at 28.8%. Both settings predominantly employed the shared decision-making model, followed by the paternalistic and informed models.

Table 1. Demography characteristics of T2DM patients

Characteristic	Hospital		Puskesmas		Total	
	n	%	n	%	n	%
Gender						
Female	33	70.2	36	69.2	69	69.7
Male	14	29.8	16	30.8	30	30.3
Total	47	100	51	100	99	100
Education						
Unschooled	1	2.1	7	13.5	8	8.1
Elementary	6	12.8	10	19.2	16	16.2
Junior High	7	14.9	5	9.6	12	12.1
Senior High	24	51.1	20	38.5	44	44.4
Diploma	6	12.8	1	1.9	7	7.1
Bachelor	3	6.4	9	17.3	12	12.1
Total	47	100	52	100	99	100
Decision-making						
Paternalistic	12	25.5	15	28.8	27	27.3
Shared	33	70.2	37	71.2	70	70.7
Informed	2	4.3	0	0	2	2.0
Total	47	100	52	100	99	100

Table 2 highlighted that the average age among participants was 60 years, with the oldest patient aged 77 and the youngest aged 28. Regarding the duration of DM, the average period was eight years, with the longest duration being 36 years and the shortest one year.

Causal Model

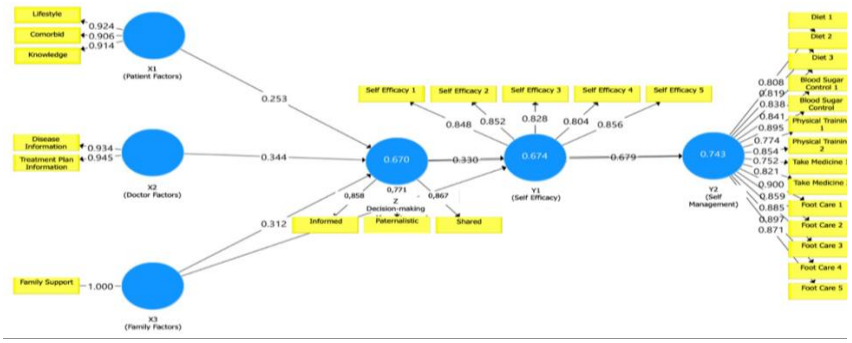

Figure 1. Outer model

Data processing utilized the Structural Equation Modeling (SEM) method based on Partial Least Squares (PLS), involving steps until achieving loading factors >0.7. Table 4 represents the outcome of PLS-SEM, commencing from the initial modeling stages to reaching the desired loading factors, ensuring no loading factor falls below 0.7. As depicted in Table 4, all loading factors for respective variables exceeded the threshold of >0.7, confirming the convergent validity of the items employed in this study.

Table 3. Outer loading results

Indicator	Loading Factor	Explanation
Patient factor		
Lifestyle	0.924	Valid
Comorbid	0.906	Valid
Knowledge	0.914	Valid
Doctor factor		
Disease information	0.934	Valid
Treatment plan information	0.945	Valid
Family factor		
Family support	1.000	Valid
Decision-making		
Paternalistic	0.771	Valid
Shared	0.867	Valid
Informed	0.858	Valid
Self-efficacy		
1	0.848	Valid
2	0.852	Valid
3	0.828	Valid
4	0.804	Valid
5	0.856	Valid
Self-management		
Diet 1	0.808	Valid
Diet 2	0.819	Valid
Diet 3	0.838	Valid
Medication intake 1	0.841	Valid
Medication intake 2	0.895	Valid
Physical activity 1	0.774	Valid
Physical activity 2	0.854	Valid
Blood sugar control 1	0.752	Valid
Blood sugar control 2	0.821	Valid
Foot treatment 1	0.900	Valid
Foot treatment 2	0.859	Valid
Foot treatment 3	0.885	Valid
Foot treatment 4	0.897	Valid
Foot treatment 5	0.871	Valid

The validity of each construct was assessed through the Average Variance Extracted (AVE), indicating good validity if exceeding >0.5. Meanwhile, the reliability test employed Cronbach's Alpha values, where variables surpassing >0.7 were deemed reliable. Table 5 demonstrates that each variable achieved a Cronbach's Alpha value >0.7, confirming their reliability. Moreover, the Composite Reliability values for each variable exceeded >0.7, placing these variables within the high-reliability category. Using the Average Variance Extracted (AVE), it was evident that all variables had an AVE >0.5, signifying the validity of each variable.

Table 4. Outer model measurement results criteria values

Variables	Cronbach's Alpha	Composite Reliability	AVE
Patient factor	0.932	0.952	0.831
Doctor factor	0.867	0.937	0.882
Family factor	1.000	1.000	1.000

Variables	Cronbach's Alpha	Composite Reliability	AVE
Decision-making	0.777	0.871	0.693
Self-efficacy	0.894	0.922	0.702
Self-management	0.969	0.972	0.714

The inner model's structural assessment was conducted to evaluate the strength of inter-variable influences and path analysis, employing T-statistic values. A T-statistic value is deemed valid when exceeding the critical value of >1.96. The significance of an effect is affirmed if the p-value stands >0.05. Figure 5.2 portrays the inner model, showcasing significant outcomes where non-significant variables have been eliminated. Results obtained through SmartPLS 3.0 software facilitated the following findings:

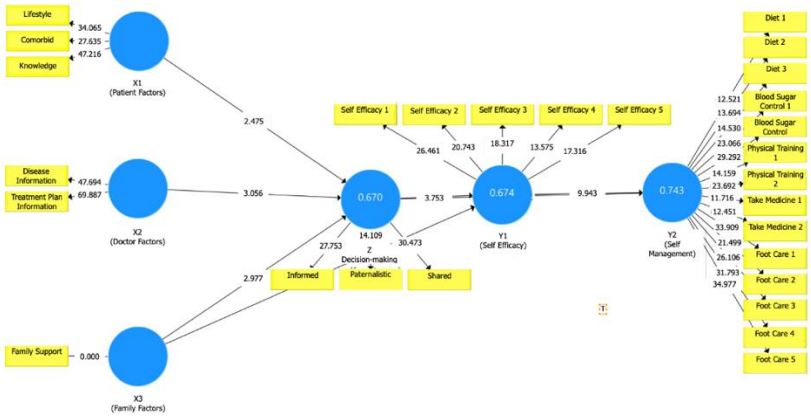

Figure 2. Inner model

The inner model's structural assessment scrutinized inter-variable relationships via bootstrapping. Referring to Table 6, the following insights are evident: 1. The impact value of patient factors on decision-making surpasses the critical value (2.475 > 1.960) with p-values below α (0.014 < 0.05), signifying a significant influence of patient factors on decision-making. 2. The influence of doctor factors on decision-making exceeds the critical value (3.056 > 1.960) with p-values below α (0.002 < 0.05), indicating a significant impact of doctor factors on decision-making. 3. Family factors' influence on decision-making surpasses the critical value (2.977 > 1.960) with p-values below α (0.001 < 0.05), suggesting a significant impact of family factors on decision-making. 4. The impact of family factors on self-efficacy surpasses the critical value (6.898 > 1.960) with p-values below α (0.000 < 0.05), highlighting a significant influence of family factors on self-efficacy. 5. Decision-making's impact on self-efficacy surpasses the critical value (3.753 > 1.960) with p-values below α (0.000 < 0.05), indicating a significant influence of decision-making on self-efficacy. 6. Self-efficacy's impact on self-management exceeds the critical value (9.943 > 1.960) with p-values below α (0.000 < 0.05), emphasizing a significant influence of self-efficacy on self-management.

Table 5. Inner model results with significant results between variables

Variables	Original sample (O)	T-Statistics (|O/STDEV|)	p-values
Patient factor in decision-making	0.253	2.475	0.014
Doctor factor in decision-making	0.344	3.056	0.002
Family factor to decision-making	0.312	2.977	0.003
Family factor to self-efficacy	0.550	6.898	0.000
Decision-making to self-efficacy	0.330	3.753	0.000
Self-efficacy to self-management	0.679	9.943	0.000

Based on Table 7, which illustrates path coefficients, the following insights can be elucidated: 1. The indirect influence value of patient factors on self-management shows an indirect effect of 0.057 with no direct impact. 2. The indirect influence value of doctor factors on self-management indicates an indirect effect of 0.077 with no direct impact. 3. The indirect influence value of family factors on self-management demonstrates an indirect effect of 0.070 with no direct impact. 4. The direct influence value of decision-making on self-management reflects a direct effect of 0.224 with no indirect influence. 5. The direct influence value of self-efficacy on self-management displays a direct effect of 0.679 with no indirect influence.

Table 6. Direct, indirect, total influence, and parameter coefficiency

Path	Influence		
	Direct	Indirect	Total
Patient factor to self-management	-	0.057	0.051
Doctor factor to self-management	-	0.077	0.078
Family factor to self-management	-	0.070	0.073
Decision-making to self-management	-	0.224	0.456
Self-efficacy to self-management	0.679	-	0.679

Based on Figure 3, the decision-making model can be delineated as follows: 1. Self-management is primarily influenced by self-efficacy, exhibiting a path coefficient of 0.679. Self-efficacy is the most influential factor affecting self-management among type 2 DM patients. 2. Family factors influence self-efficacy with a path coefficient of 0.550 and decision-making with a path coefficient of 0.330. Family factors hold a more substantial influence over self-efficacy. Among the decision-making processes—paternalistic, shared, and informed—results from the inner model reveal that shared decision-making has the most significant impact on self-efficacy. 3. Decision-making is influenced by patient factors with a path coefficient of 0.229, doctor factors with a path coefficient of 0.349, and family factors with a path coefficient of 0.326. This model concentrates on decision-making to enhance the self-management of patients. Its application involves assessing factors influencing decision-making and self-management, encompassing patient, doctor, family factors, and self-efficacy.

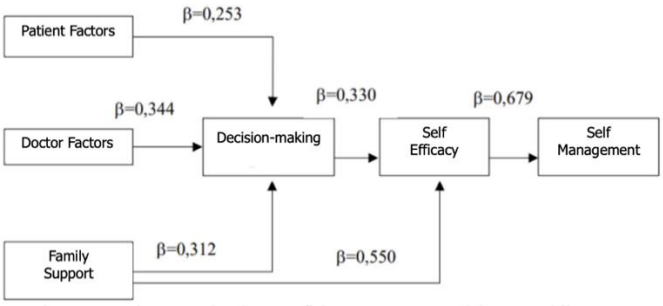

Figure 3. Path diagram and parameter coefficients of decision-making model

Decision-making in diabetes management is profoundly influenced by patient knowledge, comorbidity, and lifestyle. A deep grasp of diabetes intricacies directs patients towards shared decision-making models, signifying the pivotal role of informed patients in shaping their care strategies. Tailoring educational approaches to cater to diverse educational backgrounds becomes paramount to enriching patient knowledge (Chrvala et al., 2016; Z. Li et al., 2021). Shared decision-making garners favor among Type 2 DM patients, particularly in younger individuals with fewer comorbidities, whereas elderly patients with multiple comorbidities might benefit more from a paternalistic approach (J. Li et al., 2021).

Physicians wield significant influence through imparting disease information and treatment plans. Effective communication, patient education, and engagement are echoed in

Adams (2010), emphasizing doctors' role in fostering patient understanding. Patients benefit most when doctors explain complex matters in understandable terms and devote ample time to them (Altin & Stock, 2016). This study underscores the importance of doctors' layman's language and extensive discussion time. Encouraging consultations lasting 21-30 minutes, as advocated by Kaplan et al. (1989), proves instrumental for effective patient involvement. Facilitating patient-centered communication behavior remains pivotal in enhancing patient participation (Zandbelt et al., 2004). Comprehensive treatment information access aids in better disease management (Ng et al., 2013), as insufficient medical knowledge, hampers patients' decision-making roles.

Family dynamics significantly impact decision-making and self-efficacy in Type 2 DM patients, affecting self-care behaviors and glucose control (Pamungkas et al., 2021; Zhu et al., 2024). Supportive family networks positively correlate with patient involvement in decision-making processes, influencing treatment decisions and patient engagement with healthcare providers (Emery et al., 2019; Nixon et al., 2021). Family support substantially contributes to self-efficacy, influencing patients' beliefs and diabetes management (Nixon et al., 2021; Reisi et al., 2016). Enhanced self-efficacy and family support foster improved self-management practices (Emery et al., 2019; Reisi et al., 2016).

The choice of decision-making models significantly impacts self-efficacy among Type 2 DM patients, with shared decision-making yielding superior effects compared to other models (Ng et al., 2013). Patient decision-making enhances self-efficacy and treatment adherence, impacting care quality and outcomes. Improved patient-doctor interactions can enhance diabetes self-management through modifications in self-efficacy regarding self-care behaviors. Patients' understanding of medical decision-making influences their preference for involvement, emphasizing healthcare professionals' impact on patient preferences.

Self-efficacy profoundly influences self-management among Type 2 DM patients, serving as a key contributor to their successful management efforts. This confidence in achieving specific performance levels significantly impacts daily self-care behaviors and glycemic control (Kadirvelu et al., 2012). Type 2 diabetes self-management encompasses a spectrum of activities beyond mere adherence to a regimen, demanding patient autonomy, deliberate decision-making, and proactive problem-solving (Kadirvelu et al., 2012).

The Shared Decision-Making Model significantly enhances Type 2 DM patient self-management, fostering better outcomes, patient satisfaction, and adherence (Gao et al., 2019; Z. Li et al., 2021; Myers et al., 2018; Paget & Han, 2015). Embracing this approach facilitates tailored care, empowering patients, reducing stress, and curbing healthcare costs, all of which are pivotal in optimizing diabetes management.

CONCLUSION

The research findings highlight significant factors affecting Type 2 DM patients' decision-making and self-management. Patient, doctor, and family factors notably influence decisions based on knowledge, comorbidities, lifestyle, treatment information, and family support. Specifically, family support significantly enhances self-efficacy, while decision-making positively impacts self-efficacy. Self-efficacy, in turn, significantly drives Type 2 DM patient self-management. The shared approach emerges as the most impactful among decision-making models, enhancing patient self-management in Type 2 DM. Based on the data analysis outcomes, the researcher offers recommendations regarding the treatment decision-making model for self-management among Type 2 DM patients. Utilizing the shared decision-making model entails specific strategies: 1. Physicians should provide comprehensive information encompassing disease causation, risk factors, symptoms, potential complications, and future treatment plans. This approach fosters patient engagement during treatment decision-making, enhancing their understanding of the ailment, treatment plans, and self-care activities. 2. Enhancing physician involvement in supporting joint decision-making is pivotal. Besides disease and treatment explanations,

physicians should allocate 21-30 minutes, with a minimum of 20 minutes, for discussions, enabling them to comprehend patient treatment preferences. 3. Optimizing family involvement in supporting patients throughout Type 2 DM treatment is crucial. Family engagement extends beyond decision-making, encompassing supervision, motivation, and provision of emotional, informational, and instrumental support throughout the treatment process.

References

Adams, R. J. (2010). Improving health outcomes with better patient understanding and education. In *Risk Management and Healthcare Policy* (Vol. 3). https://doi.org/10.2147/RMHP.S7500

Altin, S. V., & Stock, S. (2016). The impact of health literacy, patient-centered communication and shared decision-making on patients' satisfaction with care received in German primary care practices. *BMC Health Services Research*, *16*(1). https://doi.org/10.1186/s12913-016-1693-y

American Diabetes Association. (2024). Comprehensive Medical Evaluation and Assessment of Comorbidities: Standards of Care in Diabetes—2024. *Diabetes Care*, *47*. https://doi.org/10.2337/dc24-S004

Barksdale, D. J., Newhouse, R., & Miller, J. A. (2014). The patient-centered outcomes research institute (PCORI): Information for academic nursing. *Nursing Outlook*, *62*(3). https://doi.org/10.1016/j.outlook.2014.03.001

Chrvala, C. A., Sherr, D., & Lipman, R. D. (2016). Diabetes self-management education for adults with type 2 diabetes mellitus: A systematic review of the effect on glycemic control. In *Patient Education and Counseling* (Vol. 99, Issue 6). https://doi.org/10.1016/j.pec.2015.11.003

Emery, K. A., Robins, J., Salyer, J., & Thurby-Hay, L. (2019). Self and Family Management in Type 2 Diabetes: Influencing Factors and Outcomes. *Nursing Science Quarterly*, *32*(3). https://doi.org/10.1177/0894318419845399

Entwistle, V. A., & Watt, I. S. (2006). Patient involvement in treatment decision-making: The case for a broader conceptual framework. *Patient Education and Counseling*, *63*(3 SPEC. ISS.). https://doi.org/10.1016/j.pec.2006.05.002

Gao, Y., Wang, J., Luo, X., Song, X., Liu, L., Ke, L., Liao, Z., Wang, D., Mu, Y., Chen, Y., & Estill, J. A. M. (2019). Quality appraisal of clinical practice guidelines for diabetes mellitus published in China between 2007 and 2017 using the AGREE II instrument. *BMJ Open*, *9*(9). https://doi.org/10.1136/bmjopen-2018-022392

Iis, D. saviqoh. (2021). Analisis pola hidup dan dukungan keluarga pada pasien diabetes melitus tipe 2 di wilayah kerja Puskesmas Payung Sekaki. *HEALTH CARE : JURNAL KESEHATAN*, *10*(1), 181–193. https://doi.org/10.36763/healthcare.v10i1.116

International Diabetes Federation. (2021). IDF Diabetes Atlas 2021 _ IDF Diabetes Atlas. In *IDF official website*.

Kadirvelu, A., Sadasivan, S., & Ng, S. H. (2012). Social support in type II diabetes care: A case of too little, too late. In *Diabetes, Metabolic Syndrome and Obesity* (Vol. 5). https://doi.org/10.2147/DMSO.S37183

Kaplan, S. H., Greenfield, S., & Ware, J. E. (1989). Assessing the effects of physician-patient interactions on the outcomes of chronic disease. *Medical Care*, *27*(3). https://doi.org/10.1097/00005650-198903001-00010

Khan, M. A. B., Hashim, M. J., King, J. K., Govender, R. D., Mustafa, H., & Kaabi, J. Al. (2020). Epidemiology of Type 2 diabetes - Global burden of disease and forecasted trends. *Journal of Epidemiology and Global Health*, *10*(1). https://doi.org/10.2991/JEGH.K.191028.001

Kumar, L., & Mohammadnezhad, M. (2022). Perceptions of patients on factors affecting diabetes self-management among type 2 diabetes mellitus (T2DM) patients in Fiji: A qualitative study. *Heliyon*, *8*(6). https://doi.org/10.1016/j.heliyon.2022.e09728

Laakso, M. (2019). Biomarkers for type 2 diabetes. In *Molecular Metabolism* (Vol. 27). https://doi.org/10.1016/j.molmet.2019.06.016

Li, J., Bao, Y., Chen, X., & Tian, L. (2021). Decision models in type 2 diabetes mellitus: A systematic review. *Acta Diabetologica*, *58*(11). https://doi.org/10.1007/s00592-021-01742-6

Li, Z., Jin, Y., Lu, C., Luo, R., Wang, J., & Liu, Y. (2021). Effects of patient decision aids in patients with type 2 diabetes mellitus: A systematic review and meta-analysis. In *International Journal of Nursing Practice* (Vol. 27, Issue 6). https://doi.org/10.1111/ijn.12914

Montori, V. M., Gafni, A., & Charles, C. (2006). A shared treatment decision-making approach between patients with chronic conditions and their clinicians: The case of diabetes. *Health Expectations*, *9*(1). https://doi.org/10.1111/j.1369-7625.2006.00359.x

Myers, A., Garnica, P., & Ling, J. (2018). Advances in Managing Type 2 Diabetes in the Elderly: A Focus on Inpatient Care and Transitions of Care. *American Journal of Therapeutics*, *25*(1). https://doi.org/10.1097/MJT.0000000000000667

Ng, C. J., Lee, P. Y., Lee, Y. K., Chew, B. H., Engkasan, J. P., Irmi, Z. I., Hanafi, N. S., & Tong, S. F. (2013). An overview of patient involvement in healthcare decision-making: A situational analysis of the Malaysian context. *BMC Health Services Research*, *13*(1). https://doi.org/10.1186/1472-6963-13-408

Nixon, A. L., Leonardi-Bee, J., Wang, H., & Chattopadhyay, K. (2021). Barriers and facilitators to type 2 diabetes management in the Caribbean region: A qualitative systematic review. In *JBI Evidence Synthesis* (Vol. 19, Issue 5). https://doi.org/10.11124/JBISRIR-D-19-00424

O'Connell, J. M., & Manson, S. M. (2019). Understanding the economic costs of diabetes and prediabetes and what we may learn about reducing the health and economic burden of these conditions. In *Diabetes Care* (Vol. 42, Issue 9). https://doi.org/10.2337/dci19-0017

Paget, L., & Han, P. (2015). A randomized controlled trial to evaluate the effectiveness of a patient-centered care management strategy in type 2 diabetes patients: The Patient-centered Assessment and Counseling for Exercise and Diet Study II. *Diabetes Research and Clinical Practice*, *110*(1), 71–80. https://doi.org/https://doi.org/10.1016/j.diabres.2015.07.032

Pamungkas, R. A., Chamroonsawasdi, K., & Usman, A. M. (2021). Unmet basic needs and family functions gaps in diabetes management practice among Indonesian communities with uncontrolled type 2 diabetes: A qualitative study. *Malaysian Family Physician*, *16*(3). https://doi.org/10.51866/oa1123

PERKENI. (2021). *Konsensus Pengelolaan dan Pencegahan Diabetes Mellitus Tipe 2 di Indonesia*.

Reisi, M., Mostafavi, F., Javadzade, H., Mahaki, B., Tavassoli, E., & Sharifirad, G. (2016). Impact of health literacy, self-efficacy, and outcome expectations on adherence to self-care behaviors in iranians with type 2 diabetes. *Oman Medical Journal*, *31*(1). https://doi.org/10.5001/omj.2016.10

World Health Organization. (2016). Global Report on Diabetes. *Isbn*, *978*. https://doi.org/ISBN 978 92 4 156525 7

World Health Organization. (2022). *Noncommunicable Diseases Progress Monitor*. https://www.who.int/publications/i/item/9789244020227

Zandbelt, L. C., Smets, E. M. A., Oort, F. J., Godfried, M. H., & De Haes, H. C. J. M. (2004). Satisfaction with the outpatient encounter: A comparison of patients' and physicians' views. *Journal of General Internal Medicine*, *19*(11). https://doi.org/10.1111/j.1525-1497.2004.30420.x

Zhu, L., Pan, Z., Shen, F., Shen, Y., & Zhang, W. (2024). Effects of family support system on the self-management behaviour of patients with T2DM: a multi-centre cross-sectional study in community settings. *Family Practice*. https://doi.org/10.1093/fampra/cmae010